

## CLAIMS

What is claimed is:

- 1           1.     An apparatus for conducting communication operations between a  
2 first mobile switching center and a second mobile switching center, comprising:  
3           a first Voice over Internet Protocol (VoIP) gateway in electronic  
4 communication with the first mobile switching center and an Internet Protocol (IP)  
5 network; and  
6           a second VoIP gateway in electronic communication with the second  
7 mobile switching center and the IP network, wherein the first VoIP gateway receives  
8 voice audio from the first mobile switching center and the second VoIP gateway receives  
9 voice audio from the second mobile switching center, and wherein the first VoIP gateway  
10 converts the voice audio received from the first mobile switching center into a first VoIP-  
11 formatted audio for communicating speech information from the first mobile switching  
12 center to the second mobile switching center, and wherein the second VoIP gateway  
13 converts the voice audio received from the second mobile switching center into a second  
14 VoIP-formatted audio for communicating speech information from the second mobile  
15 switching center to the first mobile switching center.
- 1           2.     The apparatus of Claim 1, wherein the first and second VoIP  
2 gateways are integrated into the first and second mobile switching centers, respectively.

1 3. The apparatus of Claim 1, wherein the first VoIP gateway is  
2 electrically coupled to the IP network using a first Internet access server, and wherein the  
3 second VoIP gateway is electrically coupled to the IP network using a second Internet  
4 access server.

1 4. The apparatus of Claim 1, wherein the first VoIP gateway includes  
2 a conversion means for converting the voice audio to VoIP formatted voice.

1 5. The apparatus of Claim 1, wherein the second VoIP gateway  
2 includes a conversion means for converting the VoIP formatted and voice-to-voice audio.

1           6.     A method of providing VoIP formatted communications during an  
2 inter-exchange handoff operation within a telecommunications network including a  
3 Target MSC (TMSC) having a designated channel, and a Mobile Station (MS) served by  
4 a Serving MSC (SMSC), wherein a handoff forward call connection operation occurs  
5 from the SMSC to the TMSC, comprising the steps of:

6                 determining that the handoff forward call connection operation from the  
7 SMSC to the TMSC should occur;

8                 allocating a first VoIP gateway to the SMSC;

9                 allocating a second VoIP gateway including an IP identification address to  
10 the TMSC;

11                completing a second voice path between the designated channel and the  
12 second VoIP gateway; and

13                completing a first voice path between the SMSC and the first VoIP  
14 gateway,

15                wherein the first VoIP gateway is in electronic communication with the  
16 second VoIP gateway.

1           7.     The method of Claim 6, further comprising the steps of:

2                assigning the designated channel to the TMSC, and

3                moving the MS to the designated channel of the TMSC.

1           8.     The method defined in Claim 6, further including the steps of  
2     sending an unformatted voice audio signal from the SMSC to the first VoIP gateway;  
3           formatting the unformatted voice audio signal within the first VoIP  
4     gateway to provide a formatted voice audio signal for transmission over an Internet  
5     Protocol (IP) network in electronic communication with the first and second VoIP  
6     gateway;  
7           transmitting the formatted voice audio from the first VoIP gateway to the  
8     second VoIP gateway over the IP network using the IP identification address of the  
9     second VoIP gateway; and  
10          receiving the formatted voice audio at the second VoIP gateway and  
11     recovering the unformatted voice audio signal for sending to the MS.

1           9.     The method defined by Claim 6, further including the steps of:  
2           formatting a voice over air interface audio signal by the second VoIP  
3     gateway to provide a formatted voice over air signal for voice transmission over an IP  
4     network in electronic communication with the first and second VoIP gateway;  
5           transmitting the formatted voice air interface audio signal from the second  
6     VoIP gateway to the first VoIP gateway over the IP network; and  
7           receiving the formatted voice over air signal at the first VoIP gateway and  
8     recovering the voice over air signal for sending to a call connection maintained by the  
9     SMSC.

1           10. A method of providing Voice over Internet Protocol (VoIP)  
2 operations during an inter-exchange handoff forward with path minimization call  
3 connection operation within a telecommunications network including an Anchor MSC  
4 (AMSC), a Target MSC (TMSC) having a designated channel, and a Mobile Station  
5 (MS) served by a Serving MSC (SMSC), wherein the AMSC uses a first VoIP gateway to  
6 communicate with an internet protocol (IP) network, the SMSC uses a second VoIP  
7 gateway to communicate with the IP network, and the TMSC uses a third VoIP gateway  
8 to communicate with the IP network, and wherein the handoff forward with path  
9 minimization call connection operation occurs from the AMSC to the TMSC, comprising  
10 the steps of:  
11           determining that a handoff forward call connection operation to the TMSC  
12 should occur;  
13           verifying that path minimization is supported by the AMSC;  
14           allocating the first VoIP gateway to the AMSC;  
15           allocating the third VoIP gateway including an IP identification address to  
16 the TMSC;  
17           storing the IP identification address in the AMSC;  
18           completing a voice path between the designated channel and the third  
19 VoIP gateway, wherein the first VoIP gateway is in electronic communication with the  
20 third VoIP gateway; and  
21           directing the SMSC to release the second VoIP gateway.

11. The method of Claim 10, comprising the steps of:  
verifying that the designated channel is available to support the MS; and  
moving the MS to the designated channel.

12. The method defined in Claim 10, further comprising the steps of:  
sending an unformatted voice audio signal from the AMSC to the first  
VoIP gateway;  
formatting the unformatted voice audio signal at the first VoIP gateway  
into a format suitable for transmission over the IP network;  
transmitting the formatted voice audio signal from the first VoIP gateway  
to the third VoIP gateway over the IP network; and  
receiving the formatted voice audio signal at the third VoIP gateway and  
recovering the unformatted voice audio signal for sending over an air interface to the MS.

13. The method of Claim 10, further comprising the steps of:  
sending an unformatted voice over air interface audio signal from the  
TMSF to the third VoIP gateway;  
formatting the unformatted voice over air interface audio signal at the  
third VoIP gateway into a format suitable for transmission over the IP network;  
transmitting the formatted voice over air interface audio signal from the  
third VoIP gateway to the first VoIP gateway over the IP network; and

8 receiving the formatted voice over air interface audio signal at the first  
9 VoIP gateway and recovering the unformatted voice over air interface audio signal for  
10 sending over a call connection maintained by the AMSC.

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1           14. An apparatus utilizing a first and second Voice over Internet  
2 Protocol (VoIP) gateway in electronic communication with an Internet Protocol (IP)  
3 network to substitute for the allocation of voice trunks within a telecommunications  
4 network, comprising:

5           a first mobile switching center in electronic communication with the first  
6 VoIP gateway; and

7           a second mobile switching center in electronic communication with the  
8 second VoIP gateway, wherein the first and second VoIP gateways receive voice audio  
9 from the first and second mobile switching centers, wherein the first VoIP gateway  
10 converts the voice audio from the first mobile switching center into a first VoIP-  
11 formatted audio for communicating speech information from the first mobile switching  
12 center to the second mobile switching center, and wherein the second VoIP gateway  
13 converts the voice audio from the second mobile switching center into a second VoIP-  
14 formatted audio for communicating speech information from the second mobile  
15 switching center to the first mobile switching center.

1           15. The apparatus of Claim 14, wherein the first VoIP gateway is  
2 integrated into the first mobile switching center, and wherein the second VoIP gateway is  
3 integrated into the second mobile switching center.



1           16.    The apparatus of Claim 14, wherein the first VoIP gateway is  
2   electrically coupled to the IP network using a first Internet access server, and wherein the  
3   second VoIP gateway is electrically coupled to the IP network using a second Internet  
4   access server.

1           17.    The apparatus of Claim 14, wherein the first VoIP gateway  
2   includes a conversion means for converting the voice audio to VoIP formatted voice.

1           18.    The apparatus of Claim 14, wherein the second VoIP gateway  
2   includes a conversion means for converting the VoIP formatted and voice-to-voice audio.